

## TITLE OF THE INVENTION

### OUTSIDE HANDLE APPARATUS AND CONNECTOR MECHANISM

## CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is based on and claims priority under 35 U.S.C. § 119 with respect to Japanese Patent Application 2003-021091, filed on January 29, 2003, the entire content of which is incorporated herein by reference.

## FIELD OF THE INVENTION

[0002] This invention generally relates to an outside handle apparatus and a connector mechanism.

## BACKGROUND

[0003] Recent developments have lead to a vehicle door that is provided with various types of systems for enhancing convenience for opening/closing the vehicle door, such as an electrically driven door locking system (e.g., an E-latch system) and a wireless remote controlled door locking system (e.g., a smart entry system). An outside door handle apparatus of each type of system is provided with a handle portion that is attached at an outer portion of the vehicle door and houses various types of electrical parts. Various methods have been employed in order to electrically connect these electrical parts housed in the handle portion with the vehicle.

[0004] For example, a door opening/closing system is disclosed in Japanese Patent Laid-Open Publication No. 2002-30844. According to the reference, various electrical

components in a handle portion are electrically connected to a vehicle by use of a connector and a harness or an electrical signal wire. However, when the electrical parts are electrically connected with the harness or the electrical signal wire at the vehicle side after assembling the handle portion at the vehicle door, electrical connection has to be performed in a space in which the vehicle door was assembled. This may cause increase of the hours need for assembling. Further, the system is provided with the harness. Therefore, it requires considering unpreferable touch between the harness and an adjacent door glass. This may cause increase of hours needed for designing the door placement.

[0005] In order to enhance assembling performance of the handle portion at the vehicle door, an outside handle apparatus disclosed in EP Application Publication 1108835 is provided with a handle portion integrated with a connector mechanism. According to the reference, an electrical signal wire at a handle side can be electrically connected with an electrical signal wire at a vehicle side when the handle portion is inserted or linked to the vehicle door. However, in order to achieve the aforementioned electrical connection, the handle portion is required to be a fixed type. This may shadow constrain of versatility.

[0006] A need thus exists for providing an improved outside handle apparatus and a connector mechanism, both of which are capable of enhancing assembling performance of the handle portion at the vehicle door without limiting versatility of the handle portion.

## SUMMARY OF THE INVENTION

[0007] According to an aspect of the present invention, a vehicle door outside handle apparatus includes a handle frame fixed to a vehicle door, a handle portion supported on the handle frame to be accessible from an outside of the vehicle door, at least one electrical component housed in the handle portion, a handle-side connected portion provided at the handle portion and electrically connected to the at least one electrical component housed in

the handle portion, and a frame-side connected portion provided at the handle frame. The frame-side connected portion is adapted to be engaged with the handle-side connected portion. The frame-side connected portion can be then electrically connected with the handle-side connected portion.

[0008] It is preferable that the frame-side connected portion is adapted to come in contact with the handle-side connected portion to rotate or pivot the frame-side connected portion. Alternatively, it is still preferable that the handle-side connected portion is adapted to come in contact with the frame-side connected portion to rotate or pivot the handle-side connected portion.

[0009] According to another aspect of the present invention, the handle-side connected portion and the frame-side connected portion are electrically connected when the handle-side connected portion is mated with the frame-side connected portion. In this case, it is preferable that the handle frame includes means for engaging the frame-side connected portion, and the handle-side connected portion includes means for allowing the handle portion to be assembled at a predetermined position after completely mating the handle-side connected portion with the frame-side connected portion.

[0010] According to further aspect of the present invention, a method of electrically connecting a handle portion of a vehicle with a handle frame includes inserting a part of a handle portion into a handle frame which is fixed to a door of a vehicle to mount the handle portion at a position accessible from outside the vehicle. The handle portion includes a first electrical portion, and the handle frame includes a second electrical portion. The first electrical portion of the handle portion is electrically mated with the second electrical portion of the handle frame upon insertion of the part of the handle portion into the handle frame to electrically connect the first electrical portion of the handle portion with the second electrical portion of the handle frame.

[0011] It is preferable that the handle portion houses at least one electrical component that is electrically connected to the first electrical portion of the handle portion. The at least one electrical component is electrically connected to the second electrical portion of the handle frame upon insertion of the part of the handle portion into the handle frame.

[0012] According to still further aspect of the present invention, a connector mechanism includes a handle frame fixed to a vehicle door, a handle portion supported on the handle frame to be accessible from an outside of the vehicle door, at least one electrical component housed in the handle portion, a handle-side connected portion provided at the handle portion and electrically connected to the at least one electrical component housed in the handle portion, and a frame-side connected portion provided at a handle frame. The frame-side connected portion is adapted to be mated with the handle-side connected portion. The frame-side connected portion can be then electrically connected with the handle-side connected portion. The connector mechanism further includes means for engaging the frame-side connected portion, and means for allowing the handle portion to be assembled at a predetermined position after completely mating the handle-side connected portion with the frame-side connected portion.

[0013] It is preferable that the means for allowing the handle portion to be assembled at the predetermined position releases an engaged condition of the frame-side connected portion engaged by the means for engaging.

#### BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0014] The foregoing and additional features and characteristics of the present invention will become more apparent from the following detailed description considered with reference to the accompanying drawing figures, wherein:

[0015] FIG. 1 is a cross sectional view illustrating an outside handle according to a first embodiment of the present invention;

[0016] FIG. 2 is a cross sectional view taken along a line B-B in FIG. 1;

[0017] FIG. 3 is a plan view viewed in an arrow direction C in FIG. 1;

[0018] FIG. 4 is a cross sectional view illustrating an entire structure of the outside handle taken along a line A-A in FIG. 7;

[0019] FIG. 5 is a cross sectional view illustrating a condition of a handle portion rotated at a maximum rotating amount within an allowable range according to the first embodiment;

[0020] FIG. 6 is a cross sectional view illustrating a method of assembling the handle portion to a handle frame according to the first embodiment of the present invention;

[0021] FIG. 7 is a perspective view illustrating a vehicle door according to the first embodiment of the present invention;

[0022] Fig. 8 is a cross sectional view illustrating an outside handle according to a second embodiment of the present invention;

[0023] FIG. 9 is a cross sectional view taken along a line D-D in FIG. 8;

[0024] FIG. 10 is a plan view viewed in an arrow direction E in FIG. 8;

[0025] FIG. 11 is a cross sectional view illustrating a condition of a handle portion rotated at a maximum rotating amount within an allowable range according to the second embodiment;

[0026] FIG. 12 is a cross sectional view illustrating a method of assembling the handle portion to a handle frame according to the second embodiment of the present invention;

[0027] FIG. 13 is a cross sectional view illustrating an outside handle according to a third embodiment of the present invention;

[0028] FIG. 14 is a cross sectional view taken along a line F-F in FIG. 13;

[0029] FIG. 15 is a cross sectional view illustrating a condition of a handle portion rotated at a maximum rotating amount within an allowable range according to the third embodiment;

[0030] FIG. 16 is a view schematically illustrating a condition for assembling the handle portion according to the third embodiment;

[0031] FIG. 17 is another view schematically illustrating a condition for assembling the handle portion according to the third embodiment;

[0032] FIG. 18 is further another view schematically illustrating a condition for assembling the handle portion according to the third embodiment;

[0033] FIG. 19 is still further another view schematically illustrating a condition for assembling the handle portion according to the third embodiment;

[0034] FIG. 20 is an exploded view illustrating an outside handle according to a fourth embodiment of the present invention;

[0035] FIG. 21 (a) is a schematic view for explaining a full-stroke condition of a handle portion rotated within an allowable range according to the fourth embodiment;

[0036] FIG. 21 (b) is another schematic view with a handle frame for explaining the full stroke condition of the handle portion;

[0037] FIG. 22 (a) is a process drawing for explaining a process for assembling a connector provided at a hinge arm portion of the handle portion to a connector holder according to the fourth embodiment of the present invention; and

[0038] FIG. 22 (b) is another process drawing for explaining the process for assembling the connector to the connector holder attached to the handle frame.

## DETAILED DESCRIPTION

[0039] As illustrated in FIG 7, an outside handle 11 according to a first embodiment of the present invention is mounted at a vehicle door 1. More particularly, an outside handle 11 is mounted at a vehicle rearward portion of a door outer panel 10 that defines an outer shape of the vehicle door 1. The door outer panel 10 is provided with a handle portion 12 outwardly

upstanding therefrom. The handle portion 12 is gripped by a user upon manually opening or closing the vehicle door 1.

[0040] As illustrated in FIG. 4, the outside handle 11 includes the handle portion 12 and a handle frame 13. The handle portion 12 is arranged on the exterior side of the door outer panel 10 while the handle frame 13 is arranged on the interior side of the door outer panel 10. The handle frame 13 is fixed to the door outer panel 10. The handle portion 12 is mounted on the handle frame 13, with the door outer panel 10 interposed between the handle portion 12 and the handle frame 13. The handle portion 12 can be rotated relative to the handle frame 13 with a predetermined rotational range.

[0041] More particularly, the door outer panel 10 has a curved portion 10a curved towards the vehicle inside, i.e., in a direction for extending a distance relative to the handle portion 12. The door outer panel 10 includes panel-side handle inserting openings 10b and 10c at both sides thereof, i.e., left and right sides in FIG. 4, so as to insert an arm portion of the handle portion 12 thereto. The handle frame 13 can be made of resin material and is defined to have an approximately rectangular cylindrical shape with a seating rim. Further, the handle frame 13 is curved substantially along the curved portion 10a of the door outer panel 10. The handle frame 13 includes frame-side handle inserting openings 13a and 13b at portions corresponding to the respective panel-side handle inserting openings 10b and 10c. The handle frame 13 defines a first inner space S1 and a second inner space S2 corresponding to the frame-side handle inserting openings 13a and 13b, respectively.

[0042] In the meantime, the handle portion 12 includes a handle base 14 and a handle cover 15 covering the handle base 14. The handle base 14 and the handle cover 15 can be resin made members and define an outer shape of the handle portion 12. The handle cover 15 is integrally provided with a hinge arm portion 15a at one side thereof, i.e., at a vehicle forward

side illustrated at left side in FIG. 4, and is also integrally provided with a stroke arm portion 15b at the other side thereof, i.e., at a vehicle rearward side illustrated at right side in FIG. 4.

[0043] The hinge arm portion 15a is inserted into the handle-side handle inserting opening 10b and the frame-side handle inserting opening 13a. A projection 15c at a tip end of the hinge arm portion 15a can come in contact with a lid portion 13c of the handle frame 13. The frame-side handle opening is actually defined at the lid portion 13c. The handle portion 12 is rotatably connected to the handle frame 13 with a fulcrum of a contact portion between the projection 15c and the lid portion 13c. In the meantime, the stroke arm portion 15 is inserted into the handle-side handle inserting opening 10c and the frame-side handle inserting opening 13b. A bent portion 15d at a tip end of the stroke arm portion 15b can be engaged with a known bell crank 16 such that the stroke arm portion 15b can be moved or pivoted within a predetermined angle. As described above, the handle portion 12 can be rotatably linked to the handle frame 13 about the hinge arm portion 15a, i.e. the projection 15c, within a turning range allowed by the engagement of the bent portion 15d and the bell crank 16.

[0044] The handle portion 12 includes an inner space S3 substantially blocked by the handle base 14 and the handle cover 15. The inner space S3 houses a transmitting antenna 21, a door unlocking sensor 22, and a door locking switch 23, all of which are types of electrical associated parts for enhancing convenience for opening or closing the vehicle door 1.

[0045] The transmitting antenna 21 transmits a signal for requiring identification of a portable radio unit carried by a user trying to open or close the vehicle door 1, thereby identifying that the portable radio unit carried by the user is approaching the vehicle. The door unlocking sensor 22 detects the condition of the handle portion 12, such as how much the user has touched the handle portion 12, whether the user has touched the handle portion 12, or whether the user is approaching the handle portion 12. The door locking switch 23 is manually operated for the door lock. More particularly, the door locking switch 23 is provided with a

switch button 23a mounted in the handle cover 15 and a detecting portion 23b arranged at a corresponding portion of the switch button 23a in the handle base 14. The detecting portion 23b detects the pushing operation of the switch button 23a such that the vehicle door 1 can be locked. Respective electrical signal wires of the transmitting antenna 21, the door unlocking sensor 22, and the door locking switch 23 meet together and are connected to a single flexible flat cable 24, i.e., an FFC 24, arranged at a side of the hinge arm portion 15a outside the inner space S3. The FFC24 defines an electrical signal wire at the side of the handle portion 12 and is guided out along the hinge arm portion 15a. The FFC 24 can be electrically connected to electrical signal wires at a side of the vehicle, i.e., at a side of the handle frame 13.

[0046] The following description describes one example of an electrically connected condition between the FFC 24 and the vehicle, i.e., the handle frame 13. As illustrated in FIG. 1, one side of the hinge arm portion 15a facing the stroke arm portion 15b is curved. The curved portion has a guiding claw 15e at a base end side thereof and a supporting portion 15f at a tip end side thereof. The FFC 24 has a handle-side connected portion 24b (i.e. a first electrical portion) between the guiding claw 15e and the supporting portion 15f. The handle-side connected portion 24b of the FFC 24 has plural leads 24a (i.e. a first lead) that are uncovered or exposed. According to the first embodiment of the present invention, there are at least four leads 24a. Both sides of the FFC 24 is supported by the guiding claw 15e and the FFC 24 is guided out along the hinge arm portion 15a. Further, an end of each uncovered lead 24a is inserted and supported by the supporting portion 15f.

[0047] As illustrated in FIG. 2, the hinge arm portion 15a is integrally provided with plural engaging members 15g that are respectively arranged between the respective leads 24a. According to the first embodiment of the present invention, there are the at least three engaging members 15g arranged between the respective leads 24a. Each engaging member 15g includes a bridgewall 15h extending approximately at right angels from the hinge arm

portion 15a, and an engaging portion 15i projecting in a lateral direction at a tip end of the bridgewall 15h, wherein each engaging member 15g has an approximately T-shaped cross section.

[0048] As illustrated in FIG 1, there is a plate-shaped supporting wall portion 13f provided at a bottom side of the handle frame 13 in the first inner space S1. The supporting wall portion 13f extends between facing side wall portions 13d and 13e. The supporting wall portion 13f mounts a supporting piece 13g thereon, which supports one end of a torsion coil spring 25 (i.e. means for biasing). Therefore, the one end of the torsion coil spring 25 is fixed to the handle frame 13. Further, as illustrated in FIG. 3, bearing portions 13h are defined in the respective side wall portions 13d and 13e opening in the lateral direction.

[0049] The handle frame 13 supports a connecting base 26 made of resin material. As illustrated in FIG. 3, facing side wall portions 26a and 26b are connected by a connecting wall portion 26c at a base end side of the connecting base 26 and the other connecting wall portion 26d at a tip end side thereof. Shaft portions 26e integrally and outwardly project from the base end side of the respective side wall portions 26a and 26b. The shaft portions 26e project outwardly from portions of the connecting base 26 corresponding to the bearing portions 13h. Therefore, the connecting base 26 can be rotated relative to the handle frame 13 with the shaft portions 26e inserted into the bearing portions 13h.

[0050] The connecting base 26 supports the other end of the torsion coil spring 25. The connecting base 26 includes engaging wall portions 26f and 26g, which are connected to the connecting wall portion 26c, the side wall portions 26a and 26b. The engaging wall portion 26f projects from the side wall portion 26a and the engaged wall portion 26g projects from the side wall portion 26b. The connecting base 26 further includes projecting wall portions 26h and 26i, both of which extend in a comb-shaped manner between the engaging wall portions 26f and 26g. The connecting wall portion 26c has a supporting piece 26j (shown in

FIG. 1) at an approximately central portion of the projecting wall portions 26h and 26i. The other end of the torsion coil spring 25 is supported by the supporting piece 26j. Therefore, the connecting base 26 can be biased by the torsion coil spring 25 and rotated around the shaft portions 26e in a direction to be away from the supporting wall portion 13f, i.e., towards the hinge arm portion 15a, i.e., in a counterclockwise direction in FIG. 1. The rotation of the connecting base 26 is restrained at a predetermined position by a non-illustrated stopper defined at the handle frame 13 such that the connecting base 26 can be prevented from being excessively biased in the aforementioned direction. As illustrated in FIG. 2, the bridgewall 15h of each engaging member 15g is arranged between the engaging wall portion 26f and the projecting wall portions 26h, between the projecting wall portions 26h and 26i, and between the projecting wall portion 26i and the engaging wall portion 26g. Each engaging member 15g is prevented from being dropped off in favor of the engaging portion 15i. As described above, displacement between the hinge arm portion 15a and the connecting base 26 in a right and left direction in FIG. 2, can be substantially restrained. Further, the hinge arm portion 15a and the connecting base 26 can be relatively oscillated along the engaging wall portions 26f, 26g, and the projecting wall portions 26h, 26i. The hinge arm portion 15a can be then allowed to rotate without displacing relative to the connecting base 26 in the right and left direction in FIG. 2.

[0051] A frame-side FFC 27 is provided at the connecting base 26, which can be electrically connected to the FFC 24. As illustrated in FIG. 1, the FFC 27 extends towards the base end side of the connecting base 26 along the connecting base 26. One end side of the frame-side FFC 27 is guided along the supporting wall portion 13f and is arranged at an opening side of the handle frame 13. The frame-side FFC 27 defines an electrical signal wire at the vehicle side, i.e., at the handle frame 13 side. Further, the frame-side FFC 27 can be electrically connected to the electrical signal wire at the vehicle side.

[0052] More particularly, as illustrated in FIG. 3, each side wall portion 26a and 26b has a guiding portion 26k extending from the base end portion to an intermediate portion. A supporting portion 26l is defined at each tip end portion of the engaging wall portions 26f, 26g, and the projecting wall portions 26h, 26i. The frame-side FFC 27 has a frame-side connected portion 27b (i.e. a second electrical portion) between the guiding portions 26k and the supporting portions 26l. The frame-side connected portion 27b of the FFC 27 has plural leads 27a (i.e. a second lead) that are uncovered or exposed. According to the first embodiment of the present invention, there are the at least four leads 27a. As described above, a tip end of each lead 27a is inserted and supported by each supporting portion 26l, and both sides of the FFC 27 are supported by the guiding portions 26k. The FFC 27 is then guided to the opening side of the handle frame 13 along the connecting base 26 and the supporting wall portion 13f.

[0053] The frame-side connected portion 27b of the FFC 27 is pressed to the handle-side connected portion 24b of the FFC 24 along the biasing force of the torsion coil spring 25. Therefore, the frame-side connected portion 27b can be electrically connected to the handle-side connected portion 24b by the biasing force of the torsion coil spring 25. When the handle portion 12 is rotated from a normal condition (i.e. a predetermined position) with no applied load in FIG. 1 to a full-stroke condition illustrated in FIG. 5, in which the handle 12 is rotated at a maximum rotation angle within the allowable range, the connecting base 26 is rotated along movement of the hinge arm portion 15a by the biasing force of the torsion coil spring 25. Therefore, the frame-side connected portion 27b can be also reliably electrically connected to the handle-side connected portion 24b by the biasing force of the torsion coil spring 25. Especially, the handle-side connected portion 24b is an arched structure, thereby capable of avoiding interference between the handle-side connected portion 24b and the connecting base 26 and further capable of avoiding loose connection with the frame-side

connected portion 27b. In this case, the hinge arm portion 15a and the connecting base 26 can be substantially restrained from being displaced in the lateral direction by the engaging members 15g respectively arranged between the engaging wall portion 26f and the projecting wall portion 26h, between the projecting wall portions 26h and 26i, and between the projecting wall portion 26i and the engaging wall portion 26g. Therefore, the handle-side connected portion 24b and the frame-side connected portion 27b can be prevented from being displaced in the lateral direction, thereby enabling to avoid loose connection therebetween. As illustrated in FIG. 2, there is predetermined clearances  $d$  respectively defined from the engaging portion 15i relative to the engaged wall portions 26f, 26g, and the projecting wall portions 26h, 26i. Therefore, the smooth movement of the connecting base 26 can be achieved along with the movement of the hinge arm portion 15a. When the handle portion 12 is returned from the full stroke condition to the normal condition illustrated in FIG. 1, the above electrical connection can be achieved in the same manner.

[0054] The following description will describe an example of methods of assembling the handle portion 12 to the handle frame 13. As illustrated in FIG. 6, the whole hinge arm portion 15a including the projection 15c is inserted into the first inner space S1 of the handle frame 13 through the handle inserting openings 10b and 13a. The connecting base 26 is pushed down towards the supporting wall portion 13f, i.e., in a clockwise direction in FIG. 1, around the shaft portions 26e by the hinge arm portion 15a against the biasing force of the torsion coil spring 25. At this point, a tip end of each engaging member 15g is arranged at a tip end of each of the engaging wall portions 26f, 26g, and the projecting wall portions 26h, 26i, without causing any interferences between the engaging portions 15i. Under this condition of the handle portion 12, the hinge arm portion 15a is inserted towards the lid portion 13c, and the hinge arm portion 15a is slidably moved on the connecting base 26. The

hinge arm portion 15a is then further moved with the bridgewalls 15h guided by the engaging wall portions 26f, 26g, and the projecting wall portions 26h, 26i.

[0055] As described above, upon assembling the handle portion 12 to the handle frame 13, the hinge arm portion 15a and the connecting base 26 can be restrained from being displaced in the lateral direction by the engaging members 15g respectively arranged between the engaging wall portion 26f and the projecting wall portion 26h, between the projecting wall portions 26h and 26i, and between the projecting wall portions 26i and the engaging wall portion 26g. The hinge arm 15a is then positioned so as to electrically connect the handle-side connected portion 24b with the frame-side connected portion 27b. Further, upon this assembling process, the clearance d allows the relative displacement between the hinge arm portion 15a and the connecting base 26, thereby enabling to enhance the assembling performance of the hinge arm portion 15a to the connecting base 26.

[0056] As described above, according to the first embodiment of the present invention, following effects can be obtained as non-limiting examples.

[0057] (1) The frame-side connected portion 27b, which can be electrically connected to the handle-side connected portion 24b of the hinge arm-portion 15a, is provided at the side of the handle frame 13 so as to be moved or pivoted. Therefore, when the handle portion 12 is assembled to the handle frame 13 or is supported thereby, the frame-side connected portion 27b or the connecting base 26 can be shifted within the oscillating range and be pressed to the handle-side connected portion 24b. In this case, the handle-side connected portion 24b can be electrically connected to the frame-side connected portion 27b. Further, the assembling performance of the handle portion 12 to the handle frame 13 can be enhanced. What is more, even if the handle portion 12 is a movable type, the aforementioned electrical connection can be achieved within the above oscillating range, according to the first embodiment of the present invention, thereby enabling to enhance versatility of the handle portion 12.

[0058] The frame-side connected portion 27b can be electrically connected to the handle-side connected portion 24b in an easy way such as pressing. Regardless of the normal condition or the full stroke condition of the handle portion 12, a contact pressure can be ensured by the pressing them. Therefore, the electrical connection therebetween can be reliably ensured. That is, the connecting base 26 is rotated along with the rotational operation of the handle portion 12. Therefore, the contact condition between the handle-side connected portion 24b and the frame-side connected portion 27b can be maintained, thereby enabling to ensure electrical performance.

[0059] (2) Each electrical connection between one of the leads 24a and one of the leads 27a can be separated from the adjacent electrical connection therebetween by the engaging member 15g. Therefore, even if the vehicle door 1 is taken into water for example, electrical leakage between each adjacent electrical connection can be avoided, thereby enabling to assure electrical performance.

[0060] (3) The handle-side connected portion 24b to be electrically connected to the vehicle side is provided substantially integrally with the hinge arm portion 15a. Therefore, upon assembling the handle portion 12 to the vehicle door 1, inserting performance of the handle-side connected portion 24b to the door outer panel 10 can be improved. On the other hand, if a connector such as the handle-side connected portion 24b is not substantially integrated with the hinge arm portion 15a, the connector is required to be inserted additionally.

[0061] (4) The handle-side connected portion 24b is provided at the hinge arm portion 15a that is positioned at the side of rotation center of the handle portion 12. Therefore, compared with the handle-side connected portion 24b provided at the side of the stroke arm portion 15b, the handle-side connected portion 24b does not need to be widely moved.

[0062] Further, upon designing the outside door handle, extra length of a harness, which may be necessarily considered in light of rotation of the handle portion 12, does not have to be

considered. Further, interference between the harness and adjacent components thereof, which may be necessarily considered in light of rotational displacement of the harness, does not have to be considered. Therefore, designing hours can be effectively reduced.

[0063] An outside door handle according to a second embodiment of the present invention is described hereinbelow with reference to FIGS. 8 through 12. According to the second embodiment of the present invention, a connecting base corresponding to the connecting base 26 according to the first embodiment of the present invention is provided at a side of a hinge arm portion of a handle cover. However, the other structure of the outside door handle according to the second embodiment is substantially the same as the structure according to the first embodiment, wherein some of the description thereof will be omitted therefore.

[0064] As illustrated in FIG. 8, an outside handle 31 includes a handle portion 32 and a handle frame 33. The handle portion 32 is arranged on the exterior side of the door outer panel 10 while the handle frame 33 is arranged on the interior side of the door outer panel 10. The handle frame 33 is fixed to the door outer panel 10 in the same manner as the first embodiment of the present invention. The handle portion 32 is mounted on the handle frame 33, with the door outer panel 10 interposed between the handle portion 32 and the handle frame 33. The handle portion 32 can be rotated relative to the handle frame 33 within a predetermined rotational range.

[0065] The handle frame 33 can be made of resin material and is defined to have an approximately rectangular cylindrical shape with a seating rim. The handle frame 33 includes a frame-side handle inserting opening 33a at a portion corresponding to the panel-side handle inserting opening 10b. The handle frame 33 defines a first inner space S11 corresponding to the frame-side handle inserting opening 33a.

[0066] In the meantime, the handle portion 32 includes the handle base 14 and a handle cover 35, both of which can be resin made. The handle cover 35 is substantially integrally provided

with a hinge arm portion 35a at one side thereof, i.e., at a vehicle forward side illustrated at left side in FIG. 8.

[0067] The hinge arm portion 35a is inserted into the panel-side handle inserting opening 10b and the frame-side handle inserting opening 33a. A projection 35c at a tip end of the hinge arm portion 35a can come in contact with a lid portion 33c of the handle frame 33. The handle portion 32, i.e., the handle cover 35 is rotatably connected to the handle frame 33 with a fulcrum of a contact portion between the projection 35c and the lid portion 33c.

[0068] According to the second embodiment of the present invention, the respective electrical signal wires of the transmitting antenna 21, the door unlocking sensor 22, and the door locking switch 23 meet together and are connected to a single flexible flat cable 36, i.e., an FFC 36, arranged at a side of the hinge arm portion 35a. The FFC 36 defines an electrical signal wire at the side of the handle portion 32 and is guided out along the hinge arm portion 35a. The FFC 36 can be electrically connected to an electrical signal wire at a side of the vehicle, i.e., at a side of the handle frame 33.

[0069] The following description describes one example of an electrically connected conditions between the FFC 36 and the vehicle, i.e., the handle frame 33. The hinge arm portion 35a includes side wall portions 35d and 35e extending towards a bottom portion side of the handle frame 33, i.e., towards a bottom side in FIG. 8, and a lid portion 35f connecting the side wall portions 35d and 35e. Guiding claws 35g are provided the respective side wall portions 35d and 35e along the lid portion 35f and project towards the respective side wall portions 35d and 35e. The FFC 36 is guided out along the hinge arm 35a, i.e., along the lid portion 35f, with both sides of the FFC 36 being supported by the guiding claws 35g.

[0070] As illustrated in FIG. 9, a plate-shaped supporting wall portion 35h extends between approximately intermediate portions of the side wall portions 35d and 35e. The supporting wall portion 35h has a supporting piece 35i that supports one end of a torsion coil spring 37

(i.e. means for biasing). Therefore, the one end of the torsion coil spring 37 is fixed to the hinge arm portion 35a. Further, as illustrated in FIG. 10, bearing portions 35j are defined in the respective side wall portions 35d and 35e opening in a width direction near the supporting wall portion 35h.

[0071] The hinge arm portion 35a supports a connecting base 38 made of resin material. As illustrated in FIG. 10, facing side wall portions 38a and 38b are connected by a plate-shaped connecting wall portion 38c. Shaft portions 38d are integrally provided at a base end side of the respective side wall portions 38a and 38b. The shaft portions 38d project outwardly from portions of the connecting base 38 corresponding to the bearing portions 35j. Therefore, the connecting base 38 can be rotatably linked to the hinge arm portion 35a with the shaft portions 35j inserted into the bearing portions 38d.

[0072] The connecting base 38 supports the other end of the torsion coil spring 37. The connecting base 38 has a supporting piece 38e (shown in FIGS. 8 and 9) at an approximately central portion of the connecting wall portion 38c. More particularly, the other end of the torsion coil spring 37 is supported by the supporting piece 38e. Therefore, the connecting base 38 can be biased by the torsion coil spring 37 and rotated around the shaft portions 38d in a direction to be away from the supporting wall portion 35h, i.e., towards an opposite side to the hinge arm portion 15e, i.e., in a clockwise direction in FIG. 8. The rotation of the connecting base 38 is restrained at a predetermined position by a non-illustrated stopper such that the connecting base 26 can be prevented from being excessively biased in the aforementioned direction.

[0073] As illustrated in FIG. 8, bottom surfaces of the side wall portions 38a, 38b, and the connecting wall portion 38c are curved. A guiding claw 38f is defined at a base end side of each side wall portion 38a and 38b, and supporting claws 38g are defined at a tip end side of the connecting wall portion 38c. The FFC 36 has a handle-side connected portion 36b (i.e. a

first electrical portion) between the guiding claws 38f and the supporting claws 38g. The handle-side connected portion 36b of the FFC 36 has plural leads 36a (i.e. a first lead) that are uncovered or exposed. According to the second embodiment of the present invention, there are the at least four leads 36a. Both sides of the FFC 36 are supported by the guiding claws 38f and the FFC 36 is guided out along the connecting base 38. Further, an end of each uncovered lead 36a is inserted and supported by the supporting claw 38g.

[0074] As illustrated in FIG. 9, the connecting wall portion 38c of the connecting base 38 is integrally provided with plural engaging members 38h that are respectively arranged between the respective leads 36a. According to the second embodiment of the present invention, there are the at least three engaging members 38h arranged between the respective leads 36a. Each engaging member 38h includes a bridgewall 38i extending approximately at right angles from the connecting base 38, and an engaging portion 38j projecting in a width direction at a tip end of each bridgewall 38i, wherein each engaging member 38h has an approximately T-shaped cross section.

[0075] A plate-shaped connecting wall 33f is defined at a bottom portion side of the first inner space S11 of the handle frame 33, i.e., at the bottom side in FIG. 8. The connecting wall 33f extends between the facing side wall portions 33d and 33e. As illustrated in FIG. 8, an engaging wall portion 33g is continuously defined at a tip end of the connecting wall portion 33f and extends with a slope towards the frame-side handle inserting opening 33a. As illustrated in FIG. 9, the engaging wall portion 33g includes plural engaging grooves 33h notched from a tip end side of the engaging wall portion 33g. Each engaging groove 33h corresponds to each engaging member 38h, i.e., corresponds to each bridgewall 38i. According to the second embodiment of the present invention, the engaging wall portion 33g has the at least three engaging grooves 33h. Each bridgewall 38i is inserted to the engaging groove 33h and is prevented from being dropped off by the engaging portion 38j. As

described above, the connecting base 38 and the engaging wall portion 33g can be restrained from being displaced in the lateral direction, i.e., in the right and left direction in FIG. 9. Further, the connecting base 38 and the engaging wall portion 33g, i.e., the handle frame 33 can be relatively moved or pivoted along the engaging grooves 33h. Still further, the connecting base 38, i.e., the hinge arm portion 35a can be allowed to rotate without being displaced in the lateral direction relative to the engaging grooves 33h.

[0076] A frame-side FFC 39 is provided at the engaging wall portion 33g, which can be electrically connected to the FFC 36. As illustrated in FIG. 8, the FFC 39 extends towards the base end side of the connecting base 38 along the engaging wall portion 33g. One end side of the frame-side FFC 39 is guided along the connecting wall portion 33f and is arranged at an opening side of the handle frame 33. The frame-side FFC 39 defines an electrical signal wire at the vehicle side, i.e., at the handle frame 13 side. Further, the frame-side FFC 39 can be electrically connected to the electrical signal wire at the vehicle side.

[0077] More particularly, as illustrated in FIG. 8, the engaging wall portion 33g has a guiding claw 33i extending from the base end portion to an intermediate portion. Supporting claws 33j are defined at a tip end portion of the engaging wall portion 33g. According to the second embodiment of the present invention, the engaging wall portion 33g is provided with the at least four supporting claws 33j. The FFC 39 has a frame-side connected portion 39b (i.e. a second electrical portion) between the guiding claws 33i and the supporting claws 33j. The frame-side connected portion 39b of the FFC 39 has plural leads 39a (i.e. a third lead) that are uncovered or exposed. According to the second embodiment of the present invention, there are the at least four leads 39a. Each tip end of the leads 39a of the frame-side FFC 39 is inserted and supported by each supporting claw 33j. Further, the frame-side FFC 39 is guided out to the opening side of the handle frame 33 along the engaging wall portion 33g

and the connecting wall portion 33f with both sides of the FFC 39 supported by the guiding claw 33i.

[0078] The frame-side connected portion 39b of the FFC 39 is pressed to the handle-side connected portion 36b of the FFC 36 along the biasing force of the torsion coil spring 37. Therefore, the frame-side connected portion 39b can be electrically connected to the handle-side connected portion 36b by the biasing force of the torsion coil spring 37. When the handle portion 32 is rotated from a normal condition with no applied load in FIG. 8 to a full-stroke condition illustrated in FIG. 11, in which the handle portion 32 was rotated at a maximum rotation angle within the allowable range, the connecting base 38 is rotated by the biasing force of the torsion coil spring 37 along movement of the engaging wall portion 33g. Therefore, the frame-side connected portion 39b can be reliably electrically connected to the handle-side connected portion 36b by the biasing force of the torsion coil spring 37. Especially, the handle-side connected portion 36b is an arched structure, thereby capable of avoiding interference between the handle-side connected portion 36b and the engaging wall portion 33g and further capable of avoiding loose connection between the handle-side connected portion 36b and the frame-side connected portion 39b. In this case, the connecting base 38 and the engaging wall portion 33g can be substantially restrained from being displaced in the lateral direction by the engaging members 38h inserted into the respective engaging grooves 33h. Therefore, the handle-side connected portion 36b and the frame-side connected portion 39b can be prevented from being displaced in the lateral direction, thereby enabling to avoid loose connection therebetween. As illustrated in FIG. 9, there is a predetermined clearance  $d$  between the engaging wall portion 33g and each engaging portion 38j. Therefore, smooth movement of the connecting base 38 can be achieved along with the movement of the engaging wall portion 33g. When the handle portion 32 is returned from

the full stroke condition to the normal condition illustrated in FIG. 8, the above electrical connection can be achieved in the same manner.

[0079] The following description will describe an example of method of assembling the handle portion 32 to the handle frame 33. As illustrated in FIG. 12, the whole hinge arm portion 35a already provided with the connecting base 38 is inserted into the first inner space S11 of the handle frame 33 through the handle inserting openings 10b and 33a. The connecting base 38 is pushed up to approach the hinge arm portion 35a, i.e., in a counterclockwise direction in FIG. 8, around the shaft portions 38d by the engaging wall portion 33g against the biasing force of the torsion coil spring 37. At this point, a tip end of each engaging member 38h is arranged at a tip end of each engaging groove 33h, without causing any interference with each engaging portion 38j. Under this condition of the handle portion 32, the hinge arm portion 35a is further inserted towards the lid portion 33c, and the connecting base 38 provided at the hinge arm portion 35a is slidably moved on the engaging wall portion 33g. The connecting base 38 is then moved with the bridgewalls 38i guided by the engaging grooves 33h.

[0080] As described above, also upon assembling the handle portion 32 to the handle frame 33, the connecting base 38 and the engaging wall portion 33g can be restrained from being displaced in the right and left direction by the engaging units 38h respectively inserted into the engaging grooves 33h. The connecting base 38 is eventually positioned so as to electrically connect the handle-side connected portion 36b with the frame-side connected portion 39b. Further, also upon this assembling process, the clearance d allows the relative displacement between the engaging wall portion 33g and the connecting base 38, thereby enabling to enhance the assembling performance of the engaging wall portion 33g to the connecting base 38.

[0081] As described above, according to the second embodiment of the present invention, following effects can be obtained as non-limiting examples in addition to the effects (3) and (4) according to the first embodiment of the present invention.

[0082] (1) The handle-side connected portion 36b, which can be electrically connected to the frame-side connected portion 39b of the handle frame 33, is provided at the side of the handle portion 32 so as to be moved or rotated. Therefore, when the handle portion 32 is assembled to the handle frame 33 or is supported thereby, the handle-side connected portion 36b or the connecting base 38 can be shifted within the oscillating range and can be pressed to the frame-side connected portion 39b. In this case, the handle-side connected portion 36b can be electrically connected to the frame-side connected portion 39b. Further, the assembling performance of the handle portion 32 to the handle frame 33 can be enhanced. What is more, even if the handle portion 32 is a movable type, the aforementioned electrical connection can be achieved within the above oscillating range, thereby enabling to enhance versatility of the handle portion 32.

[0083] The frame-side connected portion 39b can be electrically connected to the handle-side connected portion 36b in an easy way such as pressing. Regardless of the normal condition or the full stroke condition of the handle portion 32, a contact pressure can be ensured by the pressing therebetween. Therefore, the electrical connection therebetween can be reliably achieved. That is, the connecting base 38 is rotated along with the rotational operation of the handle portion 32. Therefore, the contact condition between the handle-side connected portion 36b and the frame-side connected portion 39b can be maintained, thereby enabling to ensure electrical performance.

[0084] (2) Each electrical connection between one of the leads 36a and one of the leads 39a can be separated from the adjacent electrical connection therebetween by the engaging member 38h. Therefore, even if the vehicle door 1 is taken into water for example, electrical

leakage between each adjacent electrical connection can be prevented, thereby enabling to assure electrical performance.

[0085] An outside door handle apparatus according to a third embodiment of the present invention will be described with reference to FIGS. 13 through 19. According to the first and second embodiments of the present invention, electrical connection is achieved by pressing the handle portion 12 provided with electrical parts against the connecting base 26 provided with the electrical part, or pressing the connecting base 38 against the connecting wall portion 33f provided with the electrical part. However, electrical connection according to the third embodiment of the present invention is achieved by connector mating. Descriptions of the same structure or method will be omitted therefore.

[0086] As illustrated in FIG. 13, an outside handle 41 includes a handle portion 42 and a handle frame 43. The handle portion 42 is arranged on the exterior side of the door outer panel 10 while the handle frame 43 is arranged on the interior side of the door outer panel 10. The handle frame 43 is fixed to the door outer panel 10 in the same manner as the first and second embodiments of the present invention. The handle portion 42 is mounted on the handle frame 43, with the door outer panel 10 interposed between the handle portion 42 and the handle frame 43. The handle portion 42 can be rotated relative to the handle frame 43 within a predetermined rotational range.

[0087] The handle frame 43 can be made of resin material and is defined to have an approximately rectangular cylindrical shape with a seating rim. The handle frame 43 includes a frame-side handle inserting opening 43a at a portion corresponding to the panel-side handle inserting opening 10b. The handle frame 43 defines a first inner space S21 corresponding to the frame-side handle inserting opening 43a.

[0088] In the meantime, the handle portion 42 includes the handle base 14 and a handle cover 45, both of which can be resin made. The handle cover 45 is integrally provided with a hinge

arm portion 45a at one side thereof, i.e., at a vehicle forward side illustrated at left side in FIG.13.

[0089] The hinge arm portion 45a is inserted into the handle inserting opening 10b and the frame-side handle inserting opening 43a. More particularly, as illustrated in FIG. 14, the handle frame 43 includes side wall portions 43d and 43e which define the first inner space S21. Each side wall portion 43d and 43e has a guiding groove 43b recessed along assembling process of the hinge arm portion 45a, i.e., along assembling process of the handle portion 42. As also illustrated in FIG. 13, each guiding groove 43b extends from the frame-side handle inserting openings 43a towards a bottom side of the handle frame 43, i.e., towards a bottom side in FIG. 13. A tip end of each guiding groove 43b is bent along a longitudinal direction of the side wall portions 43d and 43e, i.e., towards a vehicle forward. In the meantime, the hinge arm portion 45a includes side wall portions 45d and 45e, both of which extend towards the bottom side of the handle frame 43, and a lid portion 45f connecting the side wall portions 45d and 45e. Each side wall portion 45d and 45e is provided with a projection 45b projecting from an approximately intermediate portion thereof towards the facing side wall. As described later, the handle portion 42 is inserted along the guiding grooves 43b, i.e. the assembling process of the handle portion 42 when the projections 45b are engaged to the guiding grooves 43b. The handle portion 42, i.e., the handle cover 45, can be linked to the handle frame 43 and can be rotated relative thereto with a fulcrum of a contact portion between a projection 45c defined at a tip end portion of the handle portion 42 and the lid portion 43c of the handle frame 43.

[0090] According to the third embodiment of the present invention, the respective electrical signal wires of the transmitting antenna 21, the door unlocking sensor 22, and the door locking switch 23 meet together and are connected to a single flexible flat cable 46, i.e., an FFC 46 which is arranged at a side of the hinge arm portion 45a. The FFC 46 defines an

electrical signal wire at the side of the handle portion 42 and is guided out along the hinge arm portion 45a. The FFC 46 can be electrically connected to an electrical signal wire at a side of the vehicle, i.e., at a side of the handle frame 43.

[0091] The following description describes one example of electrically connected conditions between the FFC 46 and the vehicle, i.e., the handle frame 43. The hinge arm portion 45a includes a guiding claw 45g projecting towards the right side in FIG. 13, i.e. projecting approximately in parallel with a portion of the hinge arm portion 45a. The portion of the hinge arm portion 45a faces towards the vehicle rearward. The FFC 46 is guided out along the hinge arm portion 45a with both sides thereof supported by the guiding claw 45g.

[0092] As illustrated in FIG. 14, bearing portions 45h are defined in portions of the side wall portions 45d and 45e near the projections 45b. Each bearing portion 45h penetrates each side wall portion 45d and 45e in a width direction thereof. The hinge arm portion 45a supports an approximately block-shaped or rectangular-shaped connector 47 (i.e. a first electrical portion) which can be molded with a resin material. That is, a tip end side of the connector 47 (i.e. a handle-side connected portion) is integrally provided with shaft portions 47a projecting outwardly corresponding to the bearing portions 45h. The connector 47 can be rotatably linked to the hinge arm portion 45a when the shaft portions 47a are inserted into the bearing portions 45h. Further, respective branched leads of the FFC 46 are housed in the connector 47.

[0093] As illustrated in FIG. 13, the connector 47 is mated with a connector holder 48 (i.e. a frame-side connected portion, a second electrical portion) of which inner diameter is substantially the same as an outer diameter of the connector 47. The connector holder 48 is an approximately rectangular shaped structure with at least one bottom. The connector holder 48 is provided with terminals which can be electrically connected to the respective leads housed in the connector 47. Each terminal of the connector holder 48 can be reliably

electrically connected to each lead when the connector 47 is mated with the connector holder 48. Each terminal of the connector holder 48 can be electrically connected to electrical signal wires at a vehicle side via a cable 49.

[0094] The connector holder 48 is fitted into a recessed portion 43f with an approximately cylindrical structure having at least one bottom. A clearance is provided between the holder 48 and the recessed portion 43f to allow movement of the former in the latter. The recessed portion 43f is defined at a wall surface of the handle frame 45 facing the hinge arm portion 45a. Therefore, the connector holder 48 mated with the connector 47 can be oscillated relative to the handle frame 43. Further, the connector holder 48 and the connector 47 can be rotated relative to the hinge arm portion 45a. Still further, the cable 49 is inserted into an inserting bore 43g penetrating an approximately central portion of the recessed portion 43f such that the cable 49 can be electrically connected to each terminal of the connector holder 48.

[0095] When the handle portion 42 is rotated from a normal condition with no applied load in FIG. 13 to a full-stroke condition illustrated in FIG. 15, in which the handle portion 42 was rotated at a maximum rotation angle within the allowable range, the connector 47 and the connector holder 48 can be moved or pivoted relative to the handle frame 43, and can be rotated relative to the hinge arm portion 45a. Therefore, the connector 47 and the connector holder 48 are not be interfered by the handle frame 43 in response to the rotation of the handle portion 42 such that the electrical connection can be still maintained. Further, the cable 49 at the vehicle side can be reliably connected to the FFC 46 at the handle side via the connector 47 and the connector holder 48. When the handle portion 42 is returned from the full stroke condition to the normal condition illustrated in FIG. 13, the above electrical connection can be achieved in the same manner.

[0096] The following description will describe an example of methods of assembling the handle portion 42 to the handle frame 43 with reference to FIGS. 16 and 19. As illustrated in FIG. 16, when the handle portion 42 is assembled, the connector holder 48 is temporarily set at a predetermined position so as to be idly fitted into the recessed portion 43f. In the meantime, a tip end of the connector 47 is temporarily fixed at a predetermined position projected from a tip end of the hinge arm portion 45. The connector 47 can be temporarily supported by friction force between the bearing portions 45h and the shaft portions 47a, as illustrated in FIG. 14. Under the aforementioned condition, the projection 45b of the hinge arm portion 45a is positioned in the guiding groove 43b.

[0097] As illustrated in FIG. 17, the handle portion 42 is then shifted toward a tip end side of the guiding groove 43b along the guiding groove 43b with the projection 45b engaged with the guiding groove 43b. The whole hinge arm portion 45a can be inserted in to the handle frame 43, i.e., into the first inner space S21 through the handle inserting openings 10b and 43a. In this case, the stroke arm portion 15b can be inserted into the handle frame 43 through the handle inserting openings 10c and 13b. As illustrated in FIG. 18, in response to further movement of the handle portion 42, the projection 45b is arranged at the base end side of the guiding groove 43b bent in the longitudinal direction of the side wall portions 43d and 43e, i.e. in a direction of a vehicle forward. At this point, the connector 47 and the connector holder 48 are arranged to be substantially coaxial. As illustrated in FIG. 19, the handle portion 42 is then moved towards the tip end side along the guiding groove 43b with the projection 45b engaged with the guiding groove 43b. The hinge arm portion 45a is then inserted towards the lid portion 43c. The connector 47 and the connector holder 48 are restrained from being moved in the axial direction by the recessed portion 43f such that the connector 47 and the connector holder 48 can be mated. Therefore, the connector 47 can be electrically connected to the holder 48. That is, the hinge arm portion 45a and the stroke arm

portion 15b are inserted through the frame-side handle inserting openings when the handle portion 42 is moved with the projection 45b engaged with the guiding groove 43b. Further, when the projection 45b is engaged with the guiding groove 43b, the assembling direction of the hinge arm portion 45a corresponds to the axial direction of the connector 47 and the holder 48 mated with the connector 47.

[0098] As described above, according to the third embodiment of the present invention, following effects can be exerted.

[0099] (1) When the handle portion 42 is supported by the handle frame 43, the projection 45b is engaged to the guiding groove 43b. Therefore, assembling track of the hinge arm portion 45a can be restrained. That is, the hinge arm portion 45a can be assembled to the handle frame 43 along the assembling track thereof, thereby enabling to smoothly support the handle portion 42 at a normal position (i.e. at a predetermined position) of the handle frame 43. Further, the handle portion 42 can be prevented from being displaced from the normal position. Therefore, displacement between the handle portion 42 and the handle frame 43 can be reduced, thereby enabling to enhance operating feeling.

[00100] (2) The assembling track of the hinge arm portion 45a can be restrained by an easy way which uses the guiding groove 43b and the projection 45b.

[00101] (3) The hinge arm portion 45a can be assembled to the handle frame 43 along the assembling track thereof. Therefore, the connector 47 can be smoothly connected to the connector holder 48. The electrical connection therebetween can be then performed. Further, the connector 47 is arranged at the hinge arm portion 45a to be moved or rotated. That is, the connector 47 is supported by the side wall portions 45d and 45e of the hinge arm portion 45a. Therefore, the connector 47 can be mated with the holder 48, absorbing manufacturing fluctuation or assembling fluctuation. According to the third embodiment of the present invention, the assembling track of the hinge arm portion 45a includes two assembling

directions. However, the assembling track won't fluctuate so as to assemble the hinge arm portion 45a properly.

[00102] (4) The connector 47 is surrounded by an inner wall surface of the hinge arm portion 45a. The inner wall surface has a reverse C shaped cross section having the side wall portions 45d, 45e, and the lid portion 45f. The connector 47 are provided at the hinge arm portion 45a with the shaft portions 47a not projecting from an outer shape of the hinge arm portion 45a. Therefore, when the hinge arm portion 45a is assembled, the connector 47 is not interfered with other components such as the door outer panel 10, thereby enabling to avoid loosing electrical performance.

[00103] (5) The connector 47 is disposed at the hinge arm portion 45a to be moved or rotated. Therefore, when the handle portion 42 is assembled or supported by the handle frame 43, the connector 47 is mated with the holder 48 after being shifted within the above oscillating range. In this way, the electrical connection therebetween can be performed. Further, assembling performance of the handle portion 42 to the handle frame 43 can be enhanced. Still further, even if the handle portion 42 is a movable type, the electrical connection between the connector 47 and the holder 48 can be maintained within the above oscillating range, thereby enhancing versatility of the handle portion 42.

[00104] An exploded view of an outside handle in FIG. 20 according to a fourth embodiment of the present invention is viewed from a vehicle inside. An up and down direction in FIG. 20 corresponds to a vehicle vertical direction. An outside handle 51 includes a handle portion 52 and a handle frame 53. A connector 54 (i.e. a handle-side connected portion, a first electrical portion) is supported by a hinge arm portion 52a of the handle portion 52 so as to be moved or rotated in the up and down direction and in the right and left direction. A connector holder 55 (i.e. a frame-side connected portion, a second electrical portion) is supported by the handle frame 53. The connector 54 is electrically connected to an electrical signal wire at a

side of the handle portion 52. In the meantime, the connector holder 55 is electrically connected to electrical signal wires at a vehicle side.

[00105] More particularly, the hinge arm portion 52a is provided with plural supporting wall portions 52b projecting from side surfaces except for a vehicle outer side. According to the fourth embodiment of the present invention, the hinge arm portion 52a is provided with the at least three supporting wall portions 52b. The supporting wall portions 52b is provided with an engaging bore 52c having an opening in an approximately square shaped structure. In the meantime, the connector 54 is provided with plural engaging claws 54a projecting corresponding to the supporting wall portions 52b around a rear end portion of the connector 54. According to the fourth embodiment of the present invention, the connector 54 is provided with the at least three engaging claws 54a. Each engaging claw 54a has a smaller size than the engaging bore 52c, wherein each engaging claw 54a is not disengaged from an inner wall surface of the engaging bore 52c. Therefore, the connector 54 is approximately integrally supported by the hinge arm portion 52a with the engaging claws 54a engaged with the engaging bore 52c and can be moved or pivoted relative thereto. Especially, the vehicle outer side has been released. Therefore, the rotation of the connector 54 is limited to a predetermined range. When the handle portion 52 is assembled or detached, the hinge arm portion 52a and the connector 54 can not be separated.

[00106] The connector 54 is further provided with projections 54b (i.e. means for allowing) projecting at a front end side of the connector 54. The projections 54b are defined at upper and down side surfaces in FIG. 20. The projections 54b control engagement between the handle frame 53 and the connector holder 55. The connector 54 is further provided with an engaging claw 54c projecting at the vehicle outer side surface, i.e. at a side surface at an upper side in FIG.22. As described later, the engaging claw 54c links the connector 54 and the connector holder 55.

[00107] The handle frame 53 is provided with an engaging portion for engaging the handle frame 53 with the handle portion 52 in the same manner as the first, second, and third embodiments. The handle frame 53 is further provided with a structure for housing the connector holder 55 of which vehicle inside opens in the lateral direction. More particularly, the handle frame 53 is provided with engaging claws 53a, i.e. means for engaging, projecting to each other. The engaging claws 53a correspond to the projections 54b of the connector 54. The front end side of the handle frame 53 near or at the engaging claws 53a is notched in a longitudinal direction towards the vehicle forward. Therefore, the handle frame 53 can be expanded in response to flexure. In the meantime, the connector holder 55 is provided with engaging bores 55a corresponding to the engaging claws 53a. The connector holder 55 is approximately integrally assembled at the handle frame 53 and is supported thereby with the inner wall surfaces of the engaging bores 55a engaged with the engaging claws 53a. when the connector 54 is mated with the connector holder 55, the engaging claws 53a are expanded by the projections 54b. Therefore, the engaged condition between the handle frame 53 and the connector holder 55 is released.

[00108] The handle frame 53 is provided with projections 53b projecting at the vehicle inside corresponding to the engaging claw 54c. The connector holder 55 is provided with a lock 55b outwardly projecting at the vehicle outside at the rear end portion. The lock 55b corresponds to the projections 53b, i.e. the engaging claw 54c. The connector holder 55 is linked with the connector 54 with the engaging claw 54c engaged with the lock 55b. When the connector holder 55 has not been engaged with the handle frame 53, the connector holder 55 can be slidably moved in the handle frame 53 within a range in which the lock 55b comes in contact with the projection 53b.

[00109] As illustrated in FIGS. 22 (a) and (b), first of all, the connector 54 is inserted into or mated with the connector holder 55. At this point, the connector holder 55 is engaged with

the handle frame 53 by the engaging claws 53a. Therefore, the connector 54 is inserted into the connector holder 55 fixed to the handle frame 53. As described above, the connector 54 has been linked to the hinge arm portion 52a so as to be moved or pivoted relative thereto. Therefore, the connector 54 can be smoothly inserted into the connector holder 55 without undesired interference therebetween. The connector 54 is gradually inserted into the connector holder 55 as illustrated in FIG. 22 (b). The connector 54 is completely mated with the holder 55 with the engaging claw 54c engaged with the lock 55b. In this case, the electrical signal wires at the handle side can be electrically connected to the electrical signal wires at the vehicle side via the connector 54 and the connector holder 55. In response to further movement of the connector 54, the engaging claws 53a are expanded by the projection 54b, wherein the handle frame 53 is disengaged from the connector holder 55. The connector 54 is slidably moved in the handle frame 53 with the connector holder 55 within the range in which the lock 55b comes in contact with the projections 53b of the handle frame 53. The hinge arm portion 52a is hence positioned at a predetermined position of the handle frame 53, i.e. at a normal position. In other words, the assembling position of the handle frame 53 is determined by the position of the projections 53b.

[00110] The hinge arm portion 52a arranged at the normal position can be linked to the handle frame 53 and can be rotated relative thereto within a predetermined range about a rotation center in the same manner as the first, second, and third embodiments. As illustrated in FIG. 21(a), when the handle portion 52 is rotated from a normal condition illustrated at a lowermost row in FIG. 22(a) to a full stroke condition, in which the handle portion 52 is rotated within the allowable range, the connector 54 provided at the hinge arm portion 52a is integrally rotated with the connector holder 55. In this case, as illustrated in FIG. 21 (b), the connector 54 and the connector holder 55 are not interfered with the handle frame 53, since the vehicle inside of the handle frame 53 is opened.

[00111] As described above, according to the fourth embodiment of the present invention, following effects can be executed as non-limiting examples.

[00112] (1) The connector 54 is provided with the projections 54b. The projections 54b allow the handle portion 52 to be arranged at the normal position by disengaging the connector holder 55 from the connector frame 53 after completely mating the connector 54 into the connector holder 55. Therefore, the handle portion 52 is arranged at the normal position under the condition that the connector 54 has been electrically connected to the holder 55. In this case, the handle portion 52 can be prevented from being assembled during the electrical connection defect. That is, an assembling stroke of the hinge arm portion 52a to be positioned at the normal position is set to be greater than a connecting stroke thereof for completely mating the connector 54 with the connector holder 55. Therefore, the handle portion 52 can be assembled at the normal position after completely mating the connector 54 with the connector holder 55. In accordance with a relationship between the projections 53b and the lock 55b, the connector holder 55 has been supported by the engaging claws 53a and can not be moved until when the connector 54 is completely mated with the connector holder 55. The connector holder 55 can be moved with the engaging claws 53a disengaged by the projections 54b after the complete connection between the connector 54 and the holder 55. That is, in order to assemble the handle portion 52 at the normal position, the connector 54 has to be completely mated with the connector holder 55. When the complete mating has not been achieved for some reasons, the handle portion 52 can not be assembled at the normal position, i.e. at a predetermined position. Therefore, the mating defect can be found easily. In other words, when the handle portion 52 has been completely assembled to the handle frame 53, the connector 54 can be completely mated with the connector holder 55, thereby leading to complete electrical connection. Further, assembling fluctuation and fluctuation of

components in a vehicle longitudinal direction can be absorbed by adjusting a difference between the connecting stroke and the assembling stroke.

[00113] (2) The connector 54 is supported at the hinge arm portion 52a so as to be moved or rotated in the up and down direction and in the right and left direction. Therefore, assembling fluctuation, fluctuation of the components in a vehicle vertical direction, and fluctuation thereof in the vehicle lateral direction can be effectively absorbed.

[00114] (3) The vehicle inside of the handle frame 53 is opened in the lateral direction. Therefore, the connector 54 and the holder 55 can be moved or pivoted in response to the rotation of the handle portion 52 without being interfered with the handle frame 53. Especially, a contact portion between the connector 54 and the connector holder 55 is not moved. Therefore, reliability for electrical connection can be assured.

[00115] The present invention is not limited to the above described embodiments, and can be modified as described below.

[00116] According to the first embodiment of the present invention, the engaging members 15g are provided at the hinge arm portion 15a. Alternatively, the engaging members 15g can be provided at the connecting base 26.

[00117] According to the second embodiment of the present invention, the engaging members 38h are provided at the connecting base 38. Alternatively, the engaging units 38h can be provided at the handle frame 33, i.e. at the engaging wall portion 33g.

[00118] According to the first and second embodiments of the present invention, the torsion coil springs 25 and 37 are employed as the means for biasing. Alternatively, a leaf spring or a rubber can be employed as the biasing means.

[00119] According to the first and second embodiments of the present invention, each signal wire at the handle and vehicle sides are the FFC. Alternatively, the signal wire can be

represented by a Flexible Printed circuit substrate (i.e. an FPC) or a Conductive Ink Circuitry (i.e. a CIC).

[00120] According to the third embodiment of the present invention, the projections 45b are provided at the hinge arm portion 45a, and the guiding grooves 43b are provided at the handle frame 43. However, these relationships can be reverse.

[00121] According to each embodiment, electrical components housed in the handle portion can be altered in response to door opening/closing function as needed. That is, the electrical components can be altered in response to a system such as an E-latch system and a smart entry system as non-limiting examples.

[00122] According to each embodiment, the handle portion is a movable type. However, the handle portion can be a fixed type.

[00123] The principles, embodiments and modes of operation of the present invention have been described in the foregoing specification and drawings. However, the invention which is intended to be protected is not to be construed as limited to the particular embodiments disclosed. Further, the embodiments described herein are to be regarded as illustrative rather than restrictive. Plural objectives are achieved by the present invention, and yet there is usefulness in the present invention as far as one of the objectives are achieved. Variations and changes may be made by others, and equivalents employed, without departing from the spirit of the present invention. Accordingly, it is expressly intended that all such variations, changes and equivalents which fall within the spirit and scope of the present invention as defined in the claims, be embraced thereby.